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TUBERCULOSIS

CONTROL

INFORMATION

NORTH CAROLINA STATE BOARD OF HEALTH

DIVISION OF EPIDEMIOLOGY

TUBERCULOSIS CONTROL SECTION

NOVEMBER 1967

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TUBERCULOSIS: AN OVERVIEW

> "Tuberculosis is still a problem of considerable magnitude. Measures for its control are complex. Increased reduction in the incidence of tuberculosis disease and infection is attainable but will require augmented public health effort, wisely directed."
>
> - John D. Porterfield

THE PROBLEM

In the United States at the turn of the century tuberculosis was the leading cause of death. In many lands it still is. Here, the death rate has been declining since the turn of the century.

Even so, in the midsixties about 8,000 in the United States die annually of tuberculosis. At the same time some 50,000 new cases of active tuberculosis are being reported annually. Another 6,000 to 8,000 suffer a clinical relapse each year. Almost 40,000 are in hospitals being treated for tuberculosis and approximately 60,000 with active disease are receiving treatment at home.

This indicates only part of the task of public health in tuberculosis control. There is responsibility for follow-up of 250,000 whose disease became inactive less than five years ago and an equal number of contacts of recent cases. There are an estimated 25 million people in this country who have been infected some time in the past and are therefore at risk of developing active disease some time in the future. There is particular concern for finding and controlling these sources of infection, especially for children.

Tuberculosis is widely distributed but unevenly concentrated. It is more prevalent in the southeast, Appalachia, and the United States-Mexico border area than in the remaining states. It is an acute problem in large urban centers.

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The risk of developing tuberculosis varies widely by age, sex, and race. The lowest risk is in those in the 5-14 year age group. It is higher in younger children, though recognized disease is relatively rare. From adolescence the frequency of disease increases with age, particularly in females whose risk is accelerated during childbearing years. About twice as many males as females develop the disease. For all ages the incidence in nonwhites is about four times that of whites.

A SLOW DISEASE

Most disease producing bacteria double their numbers once or twice an hour; those which cause tuberculosis reproduce themselves only about once a day. It is several weeks from the time an individual acquires these organisms until there is any detectable evidence of infection. Even then the person rarely has any symptoms of disease. The tissues react, body resistance is increased, and tuberculin sensitivity develops. The organisms are contained, but not destroyed. Some of these bacteria live for long periods, indeed as long as their host, in a quiescent or slowly multiplying state. About 95 percent of infected persons continue throughout the remainder of their lives with living tubercle bacilli in residence.

Five percent or less of those infected develop active tuberculosis at some time in their lives. The contained organisms break through weakened protective barriers, and begin to multiply. The most favorable site for growth is in the upper lobes of the lungs. Here the evidence of disease develops slowly and insidiously. Eventually there is tissue destruction and the organisms are able to escape through the respiratory passages to the exterior. Often there is extensive lung damage before the individual has sufficient symptoms to seek medical attention and the disease is diagnosed.

The risk of developing tuberculosis varies widely by age, sex, and race. The lowest risk is in those in the 5-14 year age group. It is higher in younger children, though recognized disease is relatively rare. From adolescence the frequency of disease increases with age, particularly in females whose risk is accelerated during childbearing years. Adult males as they mature are likely develop the disease. For all ages the incidence in males is about four times that of whites.

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Why the infection reactivates and produces disease in one person and not in others is not understood. Depressed socio-economic conditions, malnutrition, stress (as in pregnancy) and other conditions causing lowered body resistance are doubtlessly contributing factors. Persons who have recovered from the disease, unlike any other infectious diseases, may have a recurrence. Here also the organisms renew their activity after a period of containment.

Persons of middle age may have acquired their now quiescent infection some thirty or more years ago. Many of these individuals will live another thirty or more years. Late in life they may develop the disease from the infection acquired in childhood. If the spread of tuberculosis could be stopped now, new cases would still be expected through the first half of the next century. The control, even more so, the eradication of tuberculosis will be a slow process.

The diagnosis of tuberculosis is a slow process also. Bacteriological tests take from three to six weeks. Repeat X-ray observations may be indicated after an interval of several months to evaluate a suspicious chest X-ray shadow.

There is no rapid treatment. The drugs now available are effective only against multiplying organisms. The resting or persisting organisms in quiescent cases multiply only from time to time. Hence, drug therapy must be continued daily for about two years to assure adequate drug levels when the organisms are sensitive to the medication.

CAUSE AND SPREAD

Tuberculosis is caused by a rod shaped organism now known as Mycobacterium tuberculosis. It has a waxy covering and is not killed by drying. It is

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discharged from the patient in droplets of moisture, primarily during coughing. The larger droplets settle rapidly; others, reduced in size and weight by partial drying, remain floating in the air. These droplet nuclei are of such a size that, when breathed in, they can reach the deepest portions of the air passages. Here the organisms can begin to multiply. The infection commonly spreads to regional lymph glands. Then the quiescent stage usually follows.

The tuberculosis organism is but one member of the family of Mycobacteria. Closely related organisms cause tuberculosis in cattle and in birds. Still others, the "atypical" Mycobacteria, live freely outside of animal hosts, as in the soil. Some of these occasionally produce disease in man. Four distinctive groups are recognized. They differ in their bacteriological characteristics and vary in their disease producing ability. When they cause disease, it is differentiated from tuberculosis only by bacteriological tests.

The atypical organisms greatly complicate the diagnosis, treatment, and control of tuberculosis. They may cause positive tuberculin reactions, so special tests are required to indicate whether the individual has contracted tuberculosis, or whether it is more likely an infection with one of the "atypicals."

DIAGNOSIS

Diagnostic measures have been greatly refined in recent years. Earlier the disease could be identified clinically only when far advanced. In health departments, X-ray facilities have become widely available and increasingly useful. Culturing for tubercle bacilli and related organisms is a relatively recent development. The tuberculin testing procedure has been simplified; current research aims to make these more specific tests.

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TREATMENT

It is the anti-tuberculosis drugs, available only since the midforties, which have changed the possibilities in tuberculosis control. The active case, ordinarily treated by multiple drugs, rapidly becomes noninfectious. The destruction of the persisting organism takes time. Due to an increasing amount of resistance to these drugs, treatment needs to be guided by sensitivity testing.

Lung surgery is the second great advance in the treatment of pulmonary tuberculosis. Now chronically infected lung tissue which will never heal completely, can be removed surgically. For the individual, this favors complete cure; for the community, it removes an actual or potential source for the spread of infection.

Probably the greatest advance is prophylactic treatment, with INH—a nontoxic and cheap drug. The purpose is to destroy the organisms of tuberculosis before they produce disease, or a recurrence of disease. Medication for a year once a day by mouth is indicated. Those for whom prophylactic treatment is considered particularly important are:

(1) Positive tuberculin reactors in young children and in adolescents.

(2) Inactive cases, who had no drug therapy, or inadequate therapy.

(3) Those with X-ray evidence suggesting healed pulmonary tuberculosis who also have a positive tuberculin reaction.

(4) Tuberculin positive close contacts of new active and reactivated cases of tuberculosis, and tuberculin negative individuals with very recent or continuing contact with active cases.

(5) Tuberculin reactors with increased susceptibility due to certain medical conditions.

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(5) Tuberculin reactors with increased susceptibility due to certain medical conditions.

IN SUMMARY

Present means of tuberculosis control are adequate for a program looking toward eradication. The task of public health is to assure that available means are used with increasing effectiveness.

October 1967

TUBERCULOSIS: LOCAL ACTION

> "Finding one child with a positive tuberculin test should cause alarm and send health machinery screaming down the street to do something."
>
> - Dr. Alfonso Holguin

THE URGENCY

The common concern of the directors of tuberculosis control in the states participating in this continuing education program is that expressed above by Dr. Holguin. There is need for a feeling of greater urgency in tuberculosis control.

The nature of the infection fosters procrastination. It is a "slow disease." Infection often occurs without symptoms. Some say, "If there is disease, there is also specific medication. So why be so concerned about treating persons with no symptoms of tuberculosis?" If public health workers are complacent, how can we hope to cultivate feelings of urgency in patients, families and the public generally?

"Tuberculosis eradication" could be changed from a dream to a practical objective by more effective application of available control measures.

So let us look at the available tools for tuberculosis control and see how they may be used more effectively.

THE LABORATORY

A secure diagnosis of tuberculosis requires the identification of tubercle bacilli. Other members of the same family of organisms (the atypicals) cause lesions indistinguishable from those of tuberculosis. However the source of these, the means of spread, nature of treatment, and means of prevention

TUBERCULOSIS: LOCAL ACTION

"Finding one child with a positive tuberculin test should cause alarm and send equally necessary screening down the street to do something."

- Dr. Alfredo Holguin

THE VIEWPOINT

The common concern of the directors of tuberculosis control in the states participating in this conditioning conversation program is that expressed above by Dr. Holguin. There is need for a heightening of greater urgency in tuberculosis control.

The nature of the infection Tuberculosis presents problems. It is a "slow disease." Infected cells remain without symptoms. Some say, "If there is disease, there is also possible reactivation. So why be so concerned about treating persons with or exposed to tuberculosis?" If public health workers are complacent, how can we hope to activate feelings of urgency in patients, families and the public generally?

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differ from tuberculosis. They are distinctive in their bacteriological characteristics and can be differentiated from each other and from Mycobacterium tuberculosis, the cause of tuberculosis.

Of this family of organisms, some are sensitive to anti-tuberculosis drugs, while others may be partially or highly resistant. Sensitivity tests on early isolates from all newly diagnosed cases of tuberculosis and atypical infections are needed for the guidance of treatment. Due to the slow growth of these organisms a cultural diagnosis requires from three to six weeks, and a sensitivity test almost as long. Repeat cultures and repeat sensitivity tests at intervals are indicated.

There is the "know how" in the laboratory if there are adequate facilities and enough workers.

HOSPITALS

In many states the traditional tuberculosis sanatorium is becoming an institution of the past. The anti-tuberculosis drugs have reduced the need for prolonged institutional care. Some can be treated adequately and safely at home. The usual practice is to provide more intensive hospital care for limited periods. In-patient care is indicated while drug therapy is being instituted, for treatment of resistant cases with special drugs, and for lung surgery. In some areas these services are being given in general hospitals. The essential is that free hospital beds for tuberculosis patients continue to be available. Hospital care is required for the protection of the public as well as for the welfare of the patient and his family.

CLINICS

The need for specialized clinics for tuberculosis has increased as more

differ from laboratories. They are distinctive in their bacteriological characteristics and can be differentiated from each other and from Mycobacterium tuberculosis, the cause of tuberculosis.

Of this family of organisms, some are sensitive to anti-tuberculosis drugs, while others may be partially or slightly resistant. Sensitivity tests on early isolates from all newly diagnosed cases of tuberculosis and atypical infections are needed for the guidance of treatment. Due to the slow growth of these organisms a minimal diagnosis requires four hours to six weeks, and a sensitivity test almost as long. Repeat cultures and repeat sensitivity tests at intervals are indicated.

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HOSPITALS

In many states the traditional tuberculosis sanatorium is becoming an institution of the past. The anti-tuberculosis drugs have reduced the need for prolonged institutional care. Some can be treated adequately and safely at home. The usual practice is to provide more intensive hospital care for limited periods. Long-term care is indicated while drug therapy is being instituted, for treatment of resistant cases with special drugs, and for lung surgery. In some areas these services are being given in general hospitals. The essential is that free hospital beds for tuberculosis patients continue to be available. Hospital care is required for the protection of the public as well as for the welfare of the patient and his family.

CLINICS

The need for ambulatory clinics for tuberculosis has increased as more

of the treatment is given outside of hospitals. Health Department clinics are available to aid with cases referred on release from hospital. Treatment of active cases of tuberculosis with potent drugs needs to be continued for two years or even more, most of this at home. The continuing medical supervision required can be effectively and economically provided through specialized tuberculosis clinics in health departments.

Another function of equal or more importance is the provision of treatment to prevent tuberculosis. Those needing this must be found. This involves medical and X-ray examinations, tuberculin testing, and follow-up. This is required for contacts of active cases, tuberculin positive children and their contacts, those with inactive tuberculosis who had less than adequate drug therapy, and others at high risk. All on preventive medication must be under medical observation throughout their treatment. For those not under private medical care, this is an appropriate responsibility of the tuberculosis clinic.

X-RAY FACILITIES

X-ray facilities are an essential part of hospitals and clinics. The modern mobile units, in which the X-ray findings are automatically photographed, became generally available only after World War II. They made practicable the mass X-ray surveys of the general population. Films can be read rapidly by an experienced radiologist. However, with the decreased prevalence of disease, this method of case finding has become increasingly costly per new case identified. The use of these mobile units is being restricted to the examination of high risk groups.

PRIVATE PRACTITIONERS

More tuberculosis cases are being treated by private practitioners for

of the treatment in given patients at Dynamiatrie. Health Departments clinics are available to aid with cases referred on patients from hospital. Treatment of active cases of tuberculosis with streptomycin needs to be continued for two years or even more, most of this is free. The Dynamiatrie medical supervision required can be effectively and economically provided through specialized tuberculosis clinics in health departments.

Another function of equipment more important in the prevention of tuberculosis to prevent transmission. These meaning have much to found. This involves medical and X-ray examinations, tuberculin testing, and follow-up. This is required for protection of active cases. Especially positive children and their contacts, those with positive tuberculin and have been adequate drug therapy, and others at high risk. All of preventive medication must be under medical observation through their treatment. For those not under private medical care, this is an important responsibility of the tuberculosis clinic.

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PRIVATE INSTITUTIONS

Into these relatively remote are being treated by private practitioners for

longer periods at home. Though expert in the care of the ill, physicians in private practice may fail to provide indicated preventive treatment. Home follow-up of those who are not ill but should have preventive treatment is a normal part of public health work. More cooperative participation of practitioners and public health workers is indicated.

HOME NURSING VISITS

Physicians and nurses apparently agree on the importance of home visits by public health nurses, and on the inadequacy of personnel and the lack of time to do all that should be done. During the very first visit there may be the problem of convincing the patient that he really has tuberculosis and needs treatment, particularly if he has few or no symptoms. There is the urgent need to promptly identify contacts and get them examined. There are nursing visits to prevent lapses in treatment and those to search for patients failing to keep their clinic appointment. Successful out-of-hospital management of patients and effective preventive treatment is made possible by public health nurses.

CHILD CENTERED PROGRAM

The recommendations are specific. Each child on entering school should have a tuberculin test. Confirmed positives may be as common as one or two per 100 children tested or as few as one in a thousand. For each positive there is a source case and the challenge is to find this person and determine how many others he may have infected. All found infected will require appropriate treatment. The detection of a positive reactor who subsequently is given prophylactic treatment could be the most important event in the medical care of the child and family.

longer periods at home. Though support is the care of the ill, physicians in private practice may fail to provide individual preventive treatment. Some follow-up of those who are not ill but should have preventive treatment is a normal part of public health work. More preventive participation of practitioners and public health workers is indicated.

THE HEALTHY VISITOR

Physicians are usually alarmingly aware or too suspicious of some visits by public health nurses, and on the "emergency" of personnel and the lack of time to do all that should be done. During the very first visit there may be the problem of convincing the patient that he really has tuberculosis and needs treatment, particularly if he has few or no symptoms. There is the urgent need to promptly identify contacts and get them examined. There are nursing visits to several homes in succession and those to search for patients failing to keep their clinic appointment. Successful out-of-hospital management of patients and intensive preventive treatment is made possible by public health nurses.

WHAT CONTROL PROGRAM

The recommendations are specific: When child on entering school should have a tuberculin test. Confirmed positives may be an average of one or two per 100 children tested or as few as one in a thousand. For each positive there is a search made and the children in the final case persons and determine how many others in any case infected. All found infected will require appropriate treatment. The detection of a positive reactor who subsequently is given prophylactic treatment could be the most important event in the medical care of the child and family.

A second test of all school children at about age 14 is also advised. Positive findings identify those who are at substantial risk of developing tuberculosis as young adults. Appropriate preventive measures can be taken when the risk is known.

RECORDS

An effective tuberculosis control program is dependent on an exacting system of record keeping. Observations on every case must be maintained for a period of at least five years. The records must help to assure that every suspect is followed until diagnosed. There must be information on contacts and positive tuberculin reactors. The records indicate actions to be taken. The one who maintains the records is a very important member of the tuberculosis control team.

COOPERATING AGENCIES

Tuberculosis control in the United States involves cooperative action by federal, state, and local public health personnel and the National, State and local Tuberculosis and Respiratory Disease Associations.

SUMMARY

Looking to the past there has been remarkable progress. Turning to the future there are urgent immediate needs and a very long battle ahead. The detection of tuberculosis infection in the preclinical stage and the provision of preventive treatment is tomorrow's approach to tuberculosis control.

October 1967

A second test of all school children at about age 12 is also advised. Positive findings identify those who are at maximum risk of developing tuberculosis as young adults. Appropriate preventive measures can be taken when the risk is known.

SUMMARY

An effective tuberculosis control program is developed on an enrolling system of recent knowledge. Tuberculin is given to every case and is maintained for a period of at least five years. The records must be kept in manner that every suspect is followed until diagnosed. Data must be interpreted on contacts and positive tuberculin reactions. The records indicate actions to be taken. The one who maintains the records is a very important member of the tuberculosis control team.

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IDENTIFICATION AND TREATMENT OF TUBERCULOSIS INFECTION

A Statement of the U. S. Public Health Service
National Communicable Disease Center
Tuberculosis Program
Atlanta, Georgia - June 13, 1967

The Public Health Service and its Tuberculosis Control Advisory Committee recommend that a program to identify and treat tuberculous infection be incorporated into the nationwide tuberculosis control program. As an initial step, the following goals are proposed for the 1967-1968 school year:

1) tuberculin testing of all school "leavers," all school "enterers" and all school employees;

2) chest X-ray examination of all those identified as infected;

3) multiple-drug treatment of individuals found to have clinically active disease;

4) isoniazid treatment of all infected individuals with no evidence of clinically active disease;

5) tuberculin testing of associates of school-age reactors to identify source cases and other infected persons for X-ray examination and appropriate treatment.

For tuberculosis, the value of preventive treatment with isoniazid has been definitely established by the Public Health Service trials. Prophylaxis is already recommended for contacts of active cases and for infected persons with abnormal X-rays.

Over the ten years since the trials were started, isoniazid, taken daily for one year, has decreased the frequency of disease by 75 to 80% during the year of medication, and by at least 50% thereafter. This means that for large numbers of infected persons, isoniazid is able to nullify an active or latent infection, and thereby destroy the potential for

infection to progress into clinical disease. Since all infected persons are today at considerably higher risk than the uninfected in our population, the indications for chemoprophylaxis can now be expanded to include all persons known to have had a tuberculous infection.

Tuberculin testing programs in the schools are already included or are being planned as a regular part of the tuberculosis control activities of most health departments. Preventive isoniazid treatment of all the infected identified is a logical extension and should be considered the prime purpose of any tuberculin testing program.

STATEMENT REGARDING PREVENTIVE USE OF ISONIAZID

The following was formulated by the Medical Staff of the Tuberculosis Control Section, Division of Epidemiology, North Carolina State Board of Health, in consultation with representative Medical Staff of the North Carolina Sanatorium System and Members of the Chronic Illness Committee of the North Carolina State Medical Society, and received the endorsement of the Medical Society's Executive Council, October 1967.

"As a Public Health measure, the Chronic Illness Committee endorses the preventive use of Isoniazid in those situations where in the opinion of the individual's physician or one or more physicians experienced in tuberculosis such would be in the best interests of the health of the individual, his family or community from the point of view of preventing further spread of infection. Those included may fall into one of the following groups:

(1) Infants and young children with a history of household exposure to an infectious case of tuberculosis

(2) Recent close household older child and adult contacts of an infectious case of tuberculosis who have significant tuberculin hypersensitivity

(3) Previously untreated children six years of age and under who have significant tuberculin hypersensitivity

(4) Known recent tuberculin converters of any age who have significant tuberculin hypersensitivity

(5) Certain medical situations involving uncontrolled diabetes mellitus, silicosis and those with peptic ulcer about to undergo gastrectomy where the patient has significant tuberculin hypersensitivity and for those who are placed on corticosteroid therapy

(6) Certain previously untreated or inadequately treated inactive or quiescent cases of tuberculosis

The above should receive the consideration and endorsement of local Medical Societies.

[illegible] CONTROL, PREVENTION AND [illegible]

The following was formulated by the medical staff of the Tuberculosis Control Section, Bureau of Epidemiology, North Carolina State Board of Health, in consultation with [illegible] medical staff or any North Carolina Sanatorium System and [illegible] of the North Carolina State Medical Society and approved by the Council of the Medical Society's Executive Committee, October 1 [illegible]

"As a health measure, the chronic illness complicates and increases the pressure of [illegible] situations where in the opinion of the individual's physician or one or more physicians experienced in tuberculosis such would be in the best interests of the health of the individual, his family or community from the point of view of preventing further spread of infection.

Those included may fall into one of the following groups:

(1) Patients and young children with a history of household exposure to an infectious case of tuberculosis

(2) Recent close household contacts child and adult contacts of an infectious case of tuberculosis who have significant tuberculin hypersensitivity

(3) Previously untested children six years of age and under who have significant tuberculin hypersensitivity

(4) Young recent immigrant newcomers of any age who have significant tuberculin hypersensitivity

(5) Certain medical situations involving concomitant diabetes mellitus, silicosis and those with peptic ulcer where in medical experience where the patient has significant tuberculin hypersensitivity and for those who are placed on corticosteroid therapy

(6) Certain recently immigrated or inadvertently treated inactive or quiescent cases of tuberculosis

The score should consist of consultation and assessment of local medical [illegible]

Isolation:

Note: (i) Significant tuberculin hypersensitivity in relation to the foregoing may be defined as at least 10-15 mm or greater induration after 48-96 hours following the intra-dermal injection of 0.1 cc (0.0001 mg or 5 T.U.) intermediate strength PPD-S.

(ii) Tuberculin hypersensitivity in a given individual is subject to variation due to a number of factors including increasing age in spite of the presence of infection or disease, tuberculosis or otherwise. Results should therefore always be interpreted with caution with full evaluation of history and necessary clinical, radiological and/or bacteriological investigation."

Roy V. Berry, M. D., M. P. H.
Chief, Tuberculosis Control Section
Division of Epidemiology
North Carolina State Board of Health

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CURRENT TRENDS IN NORTH CAROLINA TUBERCULOSIS MORBIDITY

Comparing the reported incidence of new active cases of tuberculosis in North Carolina over the twenty-year period 1947 to 1966, there has been slightly over a fifty percent reduction in the number of new active cases reported for the year 1966 compared to the number reported in 1947. This has occurred despite an increase in total population of almost one-third over the same period. The rate of declining incidence has been most marked during the 1950's and least marked subsequent to 1960 since which time between 1,200 and 1,400 new active cases have been reported each year. The figure for new active cases reported in 1966 was 1,266.

What information can be obtained from a breakdown of these 1,266 cases? To begin with, 60 percent of them occurred amongst non-whites. Amongst those that occurred in whites, 73 percent were in males and of those that occurred amongst non-whites, 64 percent were in males. Whereas in 1948, 37 percent of newly reported cases were in persons over 45 years of age, by 1966, 56 percent of the cases were in persons over age 45 years. If just the cases occurring in those under 45 years of age are considered, for 1966, amongst whites, 33 percent of them were females and amongst non-whites 44 percent were females.

What do we find if we look at the total reported new active pulmonary cases for 1966 by stage of disease at time of diagnosis and reporting? Of the 1,266 cases, 1,087 were pulmonary. Of these 40 percent were far advanced, 32 percent moderately advanced, 15 percent minimal, and 13 percent primary. These proportions have changed very little over the last several years.

What is the morbidity picture according to geographic region of the State? The mountain region was responsible for 7 percent of the new active cases reported in 1966, the Piedmont region for 41 percent and the Coastal

CURRENT TRENDS IN NEW CASES TUBERCULOSIS MORTALITY

Comparing the reported incidence of new active cases of tuberculosis in North Carolina over the twenty-year period 1947 to 1966, there has been slightly over a fifty percent reduction in the number of new active cases reported for the year 1966 compared to the number reported in 1947. This has occurred despite an increase in total population of almost one-third over the same period. The rate of declining incidence has been most marked during the 1950's and after another enlargement in 1960 since which time between 1,200 and 1,400 new active cases have been reported each year. The figure for new active cases reported in 1966 was 1,256.

What information can be obtained from a breakdown of these 1,256 cases? To begin with, 60 percent of them occurred amongst non-whites. Amongst those that occurred in whites, 71 percent were in males and of those that occurred amongst non-whites, 64 percent were in males. Observed in 1962, 37 percent of newly reported cases were in persons over 64 years of age, by 1966, 36 percent of the cases were in persons over age 65 years. If just the cases occurring in those under 65 years of age are considered, for 1966, amongst whites, 39 percent of them were females and amongst non-whites 64 percent were females.

What do we find if we look at the newly reported new active pulmonary cases for 1966 by stage of disease at time of diagnosis and reportedly? Of the 1,256 cases, 1,057 were pulmonary. Of these 40 percent were far advanced, 32 percent moderately advanced, 13 percent minimal, and 15 percent primary. These proportions have changed very little over the last several years.

What is the mortality picture according to geographic region of the State? The mountain region was responsible for 7 percent of the new active cases reported in 1966, the Piedmont region for 41 percent and the Coastal

Plain region for 52 percent. Twelve percent of the population reside in the mountain region, 54 percent in the Piedmont region and 34 percent in the Coastal Plain region.

What conclusions would it be reasonable to draw from this brief analysis of morbidity statistics? The reported incidence of new active cases of tuberculosis is proportionately much higher amongst non-whites than whites; it is proportionately higher in the Coastal Plain region than in the other regions; rather more than two-thirds of the pulmonary cases are not being discovered until the disease is in an advanced stage; increasing age and masculinity over the age of 45 years appear to be factors associated with development of active tuberculosis and proportionately more females, especially non-white females, under the age of 45 years are affected than females of both races over age 45 years. No information is available through the Communicable Disease Reporting system as to the socio-economic status of those persons reported as suffering from active tuberculosis.

Division of Epidemiology
North Carolina State Board of Health

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Plain region for 53 percent. Twelve percent of the population resides in the mountain region, 34 percent in the Piedmont region and 54 percent in the Coastal Plain region.

Most conclusions would lie on speculation in view from this brief analysis of morbidity statistics. The reported incidence of new active cases of tuberculosis is proportionately much higher among non-whites than whites; it is proportionately higher in the Coastal Plain region than in the other regions; rather more than two-thirds of the secondary cases are not being discovered until the disease is in an advanced stage. Increasing age and maximum by over the age of 45 years appear to be factors associated with development of active tuberculosis and proportionately more females, especially non-white females, under the age of 45 years are affected than females of both races over age 45 years. No information is available through the Communicable Disease Reporting system as to the socio-economic status of those persons reported as suffering from active tuberculosis.

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PRIORITIES TODAY IN TUBERCULOSIS CONTROL

These may be considered briefly under three headings--

Caseholding

Casefinding

Prevention

Caseholding. This means keeping under surveillance known cases. What does this achieve? In most instances, a patient who is found to have clinically active pulmonary tuberculosis will follow the advice of his physician and agree to be admitted to the sanatorium for complete evaluation and treatment with anti-tuberculous chemotherapy. In all probability, he will not require surgery although in a few cases resection of the disease bearing area(s) may materially improve his prognosis beyond that which would be attainable by drug therapy alone. Overall, the results of treatment today, if properly applied, are excellent with perhaps as many as ninety percent of patients including many with advanced disease being able to resume their former occupations and live normal lives.

When the disease can be shown to be responding satisfactorily and the patient becomes non-infectious to others, generally he will be considered for discharge from the sanatorium to continue his treatment at home under the care of his physician, usually a tuberculosis specialist available through the local health department chest clinic.

In reaching a decision about discharge from the sanatorium to continue treatment at home, several factors have to be considered to try to be reasonably certain such transfer will be in the best interests of the patient, his family and community. Not the least of these would be such things as the availability of clinic services, the home "situation," and often other diverse

psycho-social or indeed economic factors. Good communications between sanatorium and health departments are essential.

Generally speaking, all patients who have clinically active disease will require an absolute minimum of twelve to twenty-four months of continuous uninterrupted anti-tuberculous chemotherapy from the start of treatment. Several will require longer periods, and some indeed may be advised to remain on drug(s) for life. Even under the best of circumstances--a good clinical response to drugs, a co-operative patient, good chest clinic services for follow-up medical and nursing supervision after sanatorium discharge, there exists for all patients the possibility of relapse or reactivation, even for those whose treatment included surgery. For certain patients, the risk of breakdown may be greater, for example those who also have diabetes, alcoholism or silicosis. The risk will be measurably greater for those who leave the sanatorium before the doctor feels they are well enough to continue treatment at home and for those who do not continue their drug(s) as recommended by the physician.

In most cases, the risk of breakdown or reactivation (perhaps 5% of all cases treated) is highest during the first two years after discharge from the sanatorium. After five years of being inactive, the risk becomes minimal for most. The importance of caseholding is therefore, by appropriate medical and nursing supervision after hospitalization, to detect at the earliest possible time any reactivation of disease which would be dangerous to the individual himself and also those in contact with him. Reactivation means a return to the status of being infectious, that is of being capable of transmitting tuberculosis to others--family, friends, business associates, etc.

Caseholding also includes lifetime surveillance of all inactive cases, usually accomplished by an annual chest X-ray without need for other medical or nursing supervision. Special situations--those whose disease is quiescent

psycho-social or indeed economic factors, good communications between sanatorium and health departments are essential.

Generally speaking, all patients who have clinically active disease will require an absolute minimum of twelve to twenty-four months of continuous uninterrupted anti-tuberculosis chemotherapy from the start of treatment. Severe will require longer periods, and some indeed may be advised to remain on drug(s) for life. Some prefer the lack of discomfortness--a good clinical response to drugs, a co-operative patient, good home circumstances for follow up medical and nursing supervision after sanatorium discharge, these enable for all patients the possibility of relapse or reactivation, even for those whose treatment included surgery. For certain patients, the risk of breakdown may be greater, for example those who also have diabetes, alcoholism or silicosis. The risk will be measurably greater for those who leave the sanatorium before the doctor feels they are well enough to continue treatment at home and for those who do not continue their drugs (regular) as recommended by the physician.

In most cases, the risk of breakdown or reactivation (perhaps 3% of all cases treated) is highest during the first two years after discharge from the sanatorium. After five years of really intensive, the risk becomes minimal for most. The importance of assisting in therapeutic, by appropriate medical and nursing supervision after hospitalization, to assist at the earliest possible time any reactivation of disease which would be dangerous to the individual himself and also those in contact with him. Reactivation means a return to the status of being infectious, that is of being capable of transmitting tuberculosis to others--family, friends, business associates, etc.

Consolidating also includes lifelong surveillance of all inactive cases, usually accomplished by an annual chest X-ray without need for other medical or nursing supervision. Treated attentions--these cases disease is quiescent

and some patients who have complicating medical problems such as alcoholism, diabetes or become pregnant, may require more prolonged medical and nursing supervision and such supervision may need to be applied at fairly frequent intervals. Patients who do not value their health very highly and abuse generally accepted standards of healthful living or ignore the advice that has been given are more likely to suffer from a reactivation of their disease. These patients require closer supervision. It should be remembered that these sort of attitudes are sometimes harbored because of a lack of understanding of tuberculosis and how it behaves. This does not reflect too well on those of us whose job it is to assist the patient surmount his difficulties, many of which are compounded by his having tuberculosis on top of other problems.

Caseholding would include helping to change such attitudes by sympathetic and sometimes firm educational methods and appropriate referral to other agencies or resources for assistance in coping with other medical and non-medical problems. It would also include rehabilitation attempts where such might be indicated for patients severely handicapped as a result of having had tuberculosis.

To do a good job of caseholding requires adequate chest clinic organization and an accurate tuberculosis case register.

Casefinding. The most fruitful source of finding new cases today is amongst the household contacts of recently diagnosed cases of active tuberculosis. Efforts should be concentrated on identifying the close contacts of a new case, especially those in the same household as the newly discovered case, and particularly if the new case is one of advanced pulmonary disease with positive sputum. Once identified, the contacts should be brought to examination at the chest clinic, the examination consisting of a tuberculin skin test (standard Mantoux) and/or chest X-ray. Skin testing of the contacts is highly desirable and any who are positive by skin test should have a chest X-ray made. As a minimum, all

and some patients who have complicating medical problems such as alcoholism, alcoholism or become pregnant, may require more prolonged medical and nursing supervision and such supervision may need to be applied at fairly frequent intervals. Patients who do not value their health very highly and whose generally accepted standards of healthful living or ignore the advice that has been given are more likely to suffer from a reactivation of their disease. These patients require closer supervision. It should be remembered that these sort of attitudes are sometimes hardened because of a lack of understanding of tuberculosis and how it behaves. This does not reflect too well on those of us whose job it is to assist the patient surmount his difficulties, many of which are compounded by his having tuberculosis on top of other problems.

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of the contacts should be re-checked after three months by repeating the skin tests on those who were negative or doubtful and re-X-raying those who were found positive the first time. Any tuberculin converters should also be X-rayed. Further check-ups on contacts and the frequency thereof would depend amongst other things on whether the source case had been removed from the home at time of diagnosis or whether he had returned to the home prematurely before reaching a non-infectious status. The frequency and duration of check-ups on contacts after contact is broken with the source case beyond the minimum is a matter for individual judgment in the light of clinical and other circumstances surrounding each case. There is evidence to suggest lifetime follow-up of contacts where there is a strong family history of tuberculosis is a worthwhile casefinding procedure. This activity should not prevent all new contacts from being adequately followed up as and when new cases are discovered for at least three, six or twelve months.

All persons who are reported as tuberculosis suspects, that is usually those who have had a chest X-ray which has revealed a lesion which is suspicious of being a tuberculous one or where tuberculosis cannot be ruled out as a possible cause, should be assiduously followed up including hospitalization if necessary to establish the diagnosis.

In certain areas of the State and these may be small communities or parts of larger communities where there is a known high prevalence of tuberculosis, it may be practical to think in terms of a limited intensive chest X-ray survey of the entire area utilizing a mobile chest X-ray clinic such as is maintained by the State Board of Health for such purpose.

The tuberculin skin testing of school enterers with follow-up of the household associates of the positively reacting children in an effort to find the source of the child's infection is a well worthwhile program activity,

particularly in high prevalence or high incidence areas. In such areas, the same methodology applied to later school grades may be equally rewarding, perhaps in the third or fourth school grade. None of this activity is very worthwhile as a casefinding procedure unless all of the household associates of the tuberculin positive children are screened to find the source cases.

To do a good job of casefinding requires epidemiologic know-how.

Prevention. The fundamentals of prevention involve simply reducing to a minimum the opportunities for the transmission of tuberculosis germs from an infected person to others. Early casefinding, isolation and treatment to render the infected individual non-infectious will all act to reduce the opportunity for transmission of tuberculosis germs.

Are there perhaps some more refined methods that may assist in reducing the opportunities for transmission? It is now accepted on the basis of extensive controlled studies and experience that isoniazid, a tuberculo-static drug used extensively in conjunction with other anti-tuberculous drugs in treatment of clinically active disease, when given for a sufficient length of time to certain categories of persons who are at a higher risk of developing tuberculosis, may significantly prevent sizeable portions of such groups from developing clinically active disease at some point later on in time. Such categories of persons or "high risk groups" include recent household contacts of infectious cases, especially children, recent tuberculin converters of any age and young children who have significant tuberculin reactions but no known history of contact. Certain adults with inactive tuberculosis who have not previously received anti-tuberculous chemotherapy or received what today would be considered inadequate drug therapy may be included as "high risk" patients as also would some other patients having certain non-tuberculous diseases which might predispose them to developing tuberculosis.

particularly in high prevalence or high incidence areas. In such areas, the same methodology applied to later school grades may be equally rewarding, perhaps in the third or fourth school grade. Some of this activity is very worthwhile as a counselling procedure quite apart from the numerical associations of the tuberculin positive children are expected to find the source cases.

To do a good job of searching requires considerable man-hours.

Prevention. The fundamentals of preventive medicine apply: reducing to a minimum the opportunities for the transmission of tuberculosis germs from an infectious person to others. Early case-finding, isolation and treatment to render the infected individual non-infectious will all act to reduce the opportunity for transmission of tuberculosis germs.

Are there perhaps some more refined methods that may assist in reducing the opportunities for transmission? It is now accepted on the basis of extensive controlled studies our experience that isoniazid, a tuberculostatic drug used extensively in conjunction with other anti-tuberculous drugs in treatment of clinically active disease, when given for a sufficient length of time to overall, categories of persons who are at a higher risk of developing tuberculosis, may significantly prevent disease portions of such groups from developing clinically active disease at some point later on in life. Such categories of persons or "high risk groups" include recent household contacts of infectious cases, especially children, recent tuberculin conversions of any age and young children who have significant tuberculin reactions but no history of contact. Certain adults with inactive tuberculosis who have not previously received anti-tuberculous chemotherapy or received what today would be considered inadequate drug therapy may be included as "high risk" categories as also would some other patients having certain non-tuberculous diseases which might predispose them to developing tuberculosis.

The annual screening of school personnel to exclude the presence of tuberculosis in a communicable form and thus prevent opportunities for children to become infected is an important preventive measure.

Finally, opportunities to educate school leavers and adults known to have significant tuberculin hypersensitivity to the knowledge they are rather more at risk of developing a case of tuberculosis at some time later in their lives would be included as an important preventive activity.

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October 1967

THE NORTH CAROLINA TUBERCULOSIS CONTROL SPECIAL PROJECT

In the Spring of 1963, the Appropriations Committee in the United States House of Representatives in reporting on the appropriations to the Public Health Service for tuberculosis control, expressed "real concern over the current degree of effectiveness of tuberculosis control efforts in the United States" and suggested that "serious thought should be given to a study of the tuberculosis problem." Later in the year, Dr. Luther Terry, then Surgeon General of the Public Health Service, asked seven men representing medical education and practice, and the public, to serve on a Task Force on Tuberculosis. Dr. Terry asked them to consider the present unsatisfactory situation in tuberculosis, and to recommend steps the Public Health Service might take to remedy it. This report was submitted to the Surgeon General in December, 1963 and is now referred to as the "Task Force Report."

The Task Force recommended that the Public Health Service request increased appropriations to be used to raise the level of tuberculosis control activities so that modern knowledge of the disease can be applied to its fullest potential. Specifically, the Task Force recommended that grants to the States be made available for the following activities:

A. Intensification of services to unhospitalized active cases, inactive cases for five years after disease becomes inactive, and contacts of new active cases.

B. Identification of persons at risk through (1) tuberculin testing of children entering school and examination of the reactors' associates; (2) examination of school teachers and other employees working with children; and (3) routine hospital admission X-rays in public hospitals in large cities.

C. Continuing periodic examination of persons at risk and prophylactic treatment when indicated.

D. Other recommendations were to intensify professional education, establish fellowships, conduct seminars, promote research, and consider a central automatic data processing service.

E. The Committee also stated that the aforementioned services should be made available to all persons who need them without regard to their ability to pay or legal residence; and that these services should not be withheld as a means of punishment.

The first project grant in North Carolina was made in fiscal year 1964 in the amount of $30,000 primarily to renovate the tuberculosis unit in the State Laboratory. Funds were made available to purchase the necessary equipment and supplies, employ and train the needed personnel to culture all specimens received, identify all acid-fast organisms isolated, and to perform drug sensitivity tests on all acid-fast organisms suspected of being pathogenic.

The project has expanded yearly since this initial grant and as of July 1, 1967 there were 34 counties participating in the program with an annual budget exceeding $500,000.

Project funds support the following positions and activities:

PERSONNEL (FULL-TIME IN TUBERCULOSIS ACTIVITIES)

33 - Public Health Nurses
29 - Clerks
3 - Tuberculosis Investigators
2 - Laboratory Technicians
1 - X-ray Technician

PART-TIME OR FEE BASIS

4 - Physicians
2 - Clerks
6 - X-ray Technicians

OTHER ITEMS

Personnel Benefits
Travel
Supplies
Communications
Purchase and Maintenance of X-ray Equipment
Purchase and Installation of Aerosol Nebulizers

Keeping in mind the priorities previously mentioned, a review of the reports submitted from the twenty-one (21) counties which began prior to January 1, 1967 reveals the cumulative progress made during the first twelve months in each county.

	Beginning of Project	End of 1st Year
A. Number of patients at home with a diagnosis of active tuberculosis who had no bacteriology in the preceding six-month period.	163	21
B. Number of patients at home with a diagnosis of active tuberculosis who did not have a current drug prescription.	93	3
C. Number of patients at home (all stages) without either an X-ray or medical examination in the preceding twelve months.	1,001	134

It should be emphasized that in the above statistics, the so-called delinquent patients are mostly categorized as the "uncooperative" or "recalcitrant" patient, and the effort shown is certainly to be commended.

To help local and State tuberculosis controllers plan and evaluate a program which would hopefully eliminate tuberculosis as a public health problem, a Committee appointed by the United States Public Health Service formulated a statement in 1960 which has become known as the "Goals and Standards for Eliminating Tuberculosis."

Only a detailed study of each area can determine just what is meant by reasonable and attainable goals for that particular community. An intimate knowledge of each community, its resources and capabilities is of prime importance. In the final analysis, whatever may be the intent of an overall planning agency, action that is taken depends mainly upon the motivation and zeal of the local health organization which must ultimately do the actual work.

Keeping in mind the priorities previously mentioned, a review of the reports submitted from the twenty-one (21) districts which began prior to January 1, 1957 reveals the remarkable progress made during the first twelve months in each county.

	Beginning of Period	End of Period
A. Number of patients at home with a diagnosis of active tuberculosis who had no hospitalization in the preceding 48-month period.	163	27
B. Number of patients at home with a diagnosis of active tuberculosis who did not have a current drug prescription.	93	5
C. Number of patients at home (all stages) without either an X-ray or medical examination in the preceding twelve months.	1,001	134

It should be emphasized that in the above evaluation, the so-called delinquent patients are poorly categorized as the "uncooperative" or "recalcitrant" patient, and the effort should be particularly be commended.

To help local and State tuberculosis controllers plan and evaluate a program which would successfully eliminate tuberculosis as a public health problem, a Committee appointed by the United States Public Health Service formulated a statement in 1954 which has become known as the "Goals and Standards for Finding the Tuberculosis."

ONLY a detailed study of each area can determine just what is meant by reasonable and attainable goals for that particular community. An intimate knowledge of each community, its resources and liabilities is of prime importance. In the final analysis, whatever may be the lacuna of an overall planning agency, action that is taken depends mainly upon the motivation and work of the local health organization which must ultimately do the actual work.

Keeping this in mind, each of the project counties have stated independently what their particular problems are and have set their own goals. Reports submitted semi-annually by the project counties help evaluate their progress towards these goals.

The chart on the following page summarizes some of these activity reports and shows how the North Carolina Tuberculosis Special Project compares with the more than fifty other projects throughout the United States.

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PERFORMANCE STANDARDS (a)	STANDARD	AVERAGE FOR U.S.PROJECTS JUNE, 1966	AVERAGE FOR N. C. PROJECT JUNE, 1966	AVERAGE FOR N. C. PROJECT JUNE, 1967
		(53 Projects)	(17 Counties)	(23 Counties) (b)
Standard # 1				
Satisfactory Disposition of all Tuberculosis Suspects Within a Maximum of 6 Months After Being Identified	75%	87.0%	97.5%	98.1%
* Yield of New Active Cases Based on Total Suspects Examined (Per 1,000)		116	223	302
		(68 Projects)		
Standard # 3				
Prompt Examination of Contacts to New Active Cases	90%	83.7%	95.4%	95.6%
* Household Contacts to New Active Cases on Chemoprophylaxis				
Under 5 Years of Age		28.8%	27.9%	17.1%
Over 5 Years of Age		21.1%	25.4%	11.2%
* Yield of New Active Cases Per 1,000 Contacts Examined		20	7	14
		(68 Projects)		
Standard # 5				
Active Cases at Home With Drugs Currently Prescribed	90%	61.2%	92.9%	91.9%
		(68 Projects)		
Standard # 6				
Active Cases at Home (Excluding Primaries & Non-Pulmonaries) With a Bacteriological Examination Within the Preceding 6 Months	80%	51.0%	77.6%	86.0%

(a) "Goals and Standards for Eliminating Tuberculosis," Statement of a Committee appointed by the U. S. Public Health Service 1960.

(b) Does not include the eleven (11) counties added to the Project since May 1, 1967.

* Not listed as one of the Public Health Service Goals & Standards, but useful in evaluation of Tuberculosis Control Activities.

PERFORMANCE STANDARDS (a)	STANDARD	AVERAGE FOR U.S. PROJECTS JUNE, 1966	AVERAGE FOR D. C. PROJECT JUNE, 1966	AVERAGE FOR D. C. PROJECT MAY, 1967
		(53 Projects)	(27 Counties)	(23 Counties) (b)
Standard # 1				
Satisfactory Disposition of all Tuberculosis Suspects Within a Maximum of 6 Months after Being Identified	75%	87.0%	97.5%	94.1%
* Yield of New Active Cases Based on Total Suspects Examined (Per 1,000)		1.5	2.3	1.2
Standard # 2		(53 Projects)		
Prompt Contacting of Contacts to New Active Cases	90%	23.7%	95.4%	94.0%
* Roentgen Contacts to New Active Cases on Chemoprophylaxis				
Under 5 Years of Age		22.4%	27.7%	17.1%
Over 5 Years of Age		21.8%	35.6%	11.2%
* Yield of New Active Cases Per 1,000 Contacts Examined		30	7	14
Standard # 5		(53 Projects)		
Active Cases at Home With Drugs Currently Prescribed	90%	61.2%	91.3%	91.9%
Standard # 6		(53 Projects)		
Active Cases at Home (Excluding Primaries & Non-Pulmonaries) With a Bacteriological Examination Within the Preceding 6 Months	80%	51.0%	77.6%	86.7%

(a) "Goals and Standards for Eliminating Tuberculosis." Statement of a Committee appointed by the U. S. Public Health Service 1966.

(b) Does not include the eleven (11) counties added to the Project since May 1, 1967.

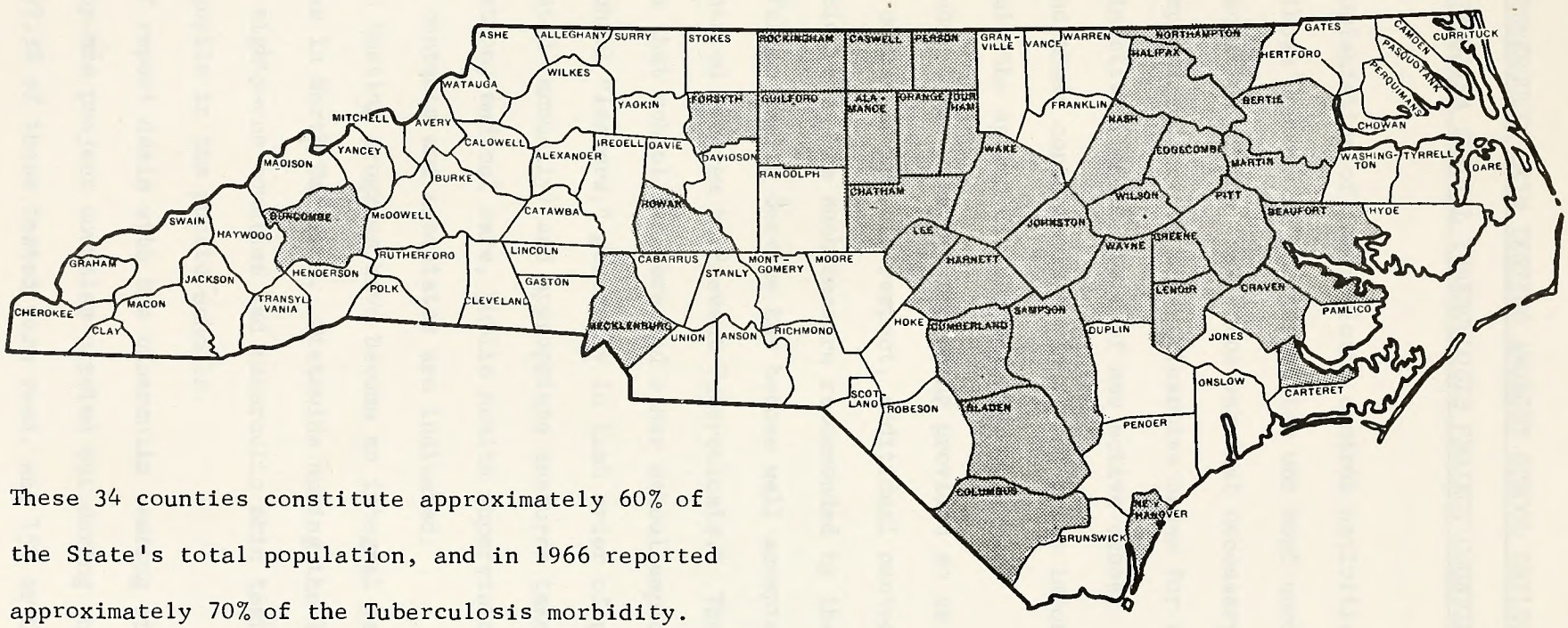
* Not listed as one of the Public Health Service Goals & Standards, but useful in evaluation of Tuberculosis

NORTH CAROLINA

Counties Receiving Support of

Tuberculosis Special Project Grants

July 1, 1967



These 34 counties constitute approximately 60% of the State's total population, and in 1966 reported approximately 70% of the Tuberculosis morbidity.

A REVIEW OF TUBERCULIN SKIN TESTING AMONGST SCHOOL CHILDREN IN TWENTY-ONE NORTH CAROLINA SPECIAL TUBERCULOSIS PROJECT COUNTIES, 1966-67

Rational orientation of tuberculosis control activities should be directed toward those persons in the population who most need service. Thus, the first recommendation of the Task Force was that necessary services be provided to unhospitalized active cases, inactive cases for five years after disease becomes inactive, and contacts of new active cases. Adequate attention to known cases and their contacts is obviously of prime importance in attempting to prevent or limit the spread of tuberculosis.

However, when these services are being provided so as to fully meet the needs of the community in this respect, additional control measures should be earnestly considered. One such measure recommended by the Task Force and outlined by the Public Health Service has become well accepted. It is known as "The Child-Centered Program to Prevent Tuberculosis." The essentials of this approach are that school teachers and other school employees, school "enterers" and school "leavers," generally in that order of priority, should be tuberculin tested (annually) and appropriate measures taken when additional follow-up examination, medical care, public health supervision and epidemiologic investigation of contacts and associates are indicated.

Tuberculin testing programs have become an integral part of tuberculosis control activities in North Carolina. Statewide during the 1966-67 school year, reports indicate eighty-one counties had tuberculin skin testing programs for all first grade pupils in the public schools.

This brief report deals with the tuberculin testing of 24,864 school enterers in twenty-one project counties carried out during the 1966-67 school year; 24,204 or 97.3% of those tested were read, and 159 or 0.7% were classified

A REVIEW OF TUBERCULIN SKIN TESTING AMONG SCHOOL CHILDREN IN TWENTY-ONE NORTH CAROLINA SPECIAL TREATMENT-SERVICE FOCUSED COUNTIES, 1966-67

National attestations of tuberculosis control activities should be directed toward those persons in the population who most need services. This, the first recommendation of the Task Force was that recondary services be provided to undosptitalized active cases, inactive cases for five years after disease becomes inactive, and contacts of new active cases. Adequate attention to known cases and their contacts is obviously of prime importance in attempting to prevent or limit the spread of tuberculosis.

However, when these services are being provided so as to fully meet the needs of the community in this respect, additional control measures should be seriously considered. One such measure recommended by the Task Force and outlined by the Public Health Service has become well accepted. It is known as "The Child-Centered Approach to Eradicate Tuberculosis." The essentials of this approach are that school teachers and other school employees, school "workers" and school "leaders", generally in that order of priority, should be tuberculin tested (annually) and appropriate measures taken when additional follow-up examinations, medical care, public health supervision and epidemiological investigation of contacts and associates are indicated.

Tuberculin testing programs have become an integral part of tuberculosis control activities in North Carolina. Statewide during the 1966-67 school year reports indicate eighty-one counties had tuberculin skin testing programs for all first grade pupils in the public schools.

This brief report deals with the tuberculin testing of 22,854 school children in twenty-one project counties carried out during the 1966-67 school year; 24,204 or 97.7% of these tested were read, and 149 or 0.7% were classified

as positive reactors, according to local policy. (See Table I.) The question as to what constitutes a "positive" tuberculin test reaction for tuberculosis presents a number of difficulties since different criteria as to size of reaction were used for the tuberculin tests. In fact, for these twenty-one counties, thirteen different positive and retest policies were chosen by the local health authorities.

The following table provides a more detailed analysis of school enterer tuberculin testing results in the twenty-one counties according to type of test administered.

TABLE I

SCHOOL ENTERERS

TEST (TYPE)	CENSUS		TESTED		READ		DEFINITE POSITIVE		DOUBTFUL POSITIVE RETESTED W/MANTOUX		TOTAL POSITIVE (1) + (2)	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	POS.	NO.	%
Mantoux Intradermal	5828	17.5	4233	72.6	4143	97.9	(1) 21	.5	-	(2) -	21	.5
Jet Injector	-	-	-	-	-	-	-	-	-	-	-	-
Sterneedle (Heaf)	10407	31.2	7236	69.5	7000	96.7	45	.6	72	2	47	.7
Tine	17053	51.3	13395	78.5	13061	97.5	60	.5	306	31	91	.7
TOTAL	33288	100.0	24864	74.6	24204	97.3	126	.5	378	33	159	.7

A total of 150 of the 159 reactors received associate follow-up. 794 associates were identified (5.4 associates per reactor) and 762, or 96% received appropriate examination. For eleven, who were considered to be at high risk of developing tuberculosis, a year's course of prophylactic isoniazid

as positive reactors, amounting to local points. (See Table I.) The question as to what constitutes a "positive" tuberculin test remains. The tuberculosis presents a number of difficulties since different criteria as to size of reaction were used for the tuberculin tests. In each of the ninety-one counties, thirteen different positive and return positives were obtained by the local health authorities.

The following table provides a more detailed analysis of school entrant tuberculin testing results in the ninety-one counties according to type of test administered.

TABLE I

SCHOOL ENTRANTS

TEST (TYPE)	CENSUS		TWENTY		GRAD		BRITTY POSITIVE		INTERNM POSITIVE RETURNED ACCORDANCE		TOTAL POSITIVE (1 + 2)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Mantoux Intradermal	5825	74.5	2483	75.0	4143	97.9	1) 21	.6	—	— (2)	21	.5
Jet Injector	—	—	—	—	—	—	—	—	—	—	—	—
Sterneodia (Heat)	1047	21.2	7256	94.3	2000	96.7	45	.6	72	2	47	.2
Tine	1722	52.3	1-Tuv	96.3	3001	97.5	50	.5	306	31	91	.7
TOTAL	3329	100.0	2483	74.6	4204	97.3	126	.5	378	33	159	.7

A total of 159 of the 159 reactors received associate follow-up. 74% associates were identified (i.e. associates per reactor) and 70% or 90% received appropriate examination. For sixteen, who were considered to be at high risk of developing tuberculosis, a year's course of prophylaxis isoniazid (2%)

was recommended. To dramatically illustrate the efficacy of tuberculin testing school enterers, three new active cases of tuberculosis were discovered during the follow-up of the associates, a rate of 3.7 per 1,000 associates examined.* In the Young Adolescent Group (Grades 7, 8, and 9) 18,840 were tested and 18,346 (97.7%) of those tested were read; 494 (2.7%) were identified as positive reactors.

In summary, the success of the child-centered program to prevent tuberculosis in these twenty-one North Carolina counties or indeed the State as a whole cannot be measured solely by the discovery of three or any number of new active cases of tuberculosis. One must also consider the number of people discovered who are at high risk of developing tuberculosis, for whom regular medical supervision can be provided, and finally, the children who are permitted to grow up without being exposed to the disease.

*The new active case rate was 0.5 per 1,000 persons examined during the mass chest X-ray survey program conducted by the Tuberculosis Control Section, North Carolina State Board of Health (1964).

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October 1967

was recommended. To dramatically illustrate the efficacy of tuberculin testing school entrants, three new active cases of tuberculosis were discovered during the follow-up of the associates, a rate of 3.7 per 1,000 associates examined.* In the Young Adolescent Group (Grades 7, 8, and 9) 16,810 were tested and 16,346 (97.7%) of those tested were read; 454 (2.7%) were identified as positive reactors.

In summary, the success of the anti-sanatorium program to prevent tuberculosis in these twenty-one North Carolina counties or indeed the State as a whole cannot be measured solely by the discovery of three or any number of new active cases of tuberculosis. One must also consider the number of people discovered who are at high risk of developing tuberculosis, for whom regular medical supervision can be provided, and finally, the children who are permitted to grow up without being exposed to the disease.

*The new active case rate was 0.3 per 1,000 persons examined during the mass chest X-ray survey program conducted by the Tuberculosis Control Section, North Carolina State Board of Health (1964).

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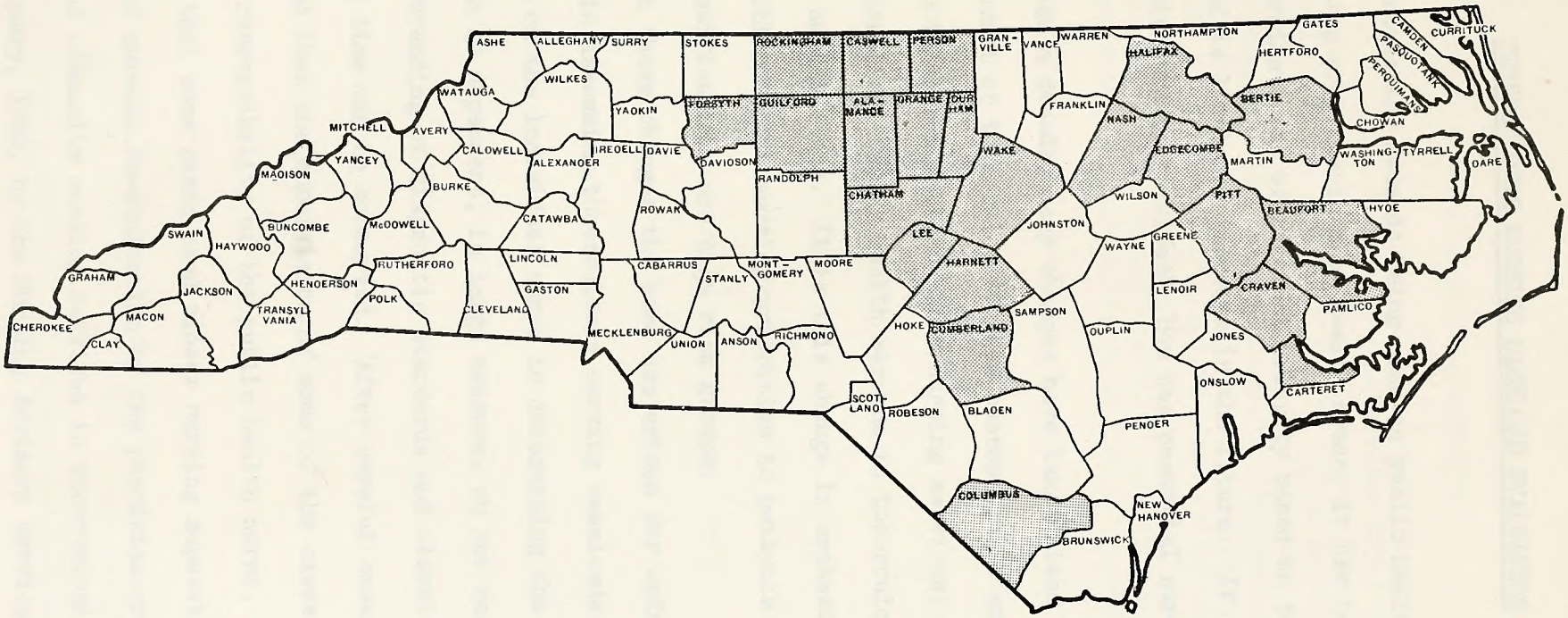
NORTH CAROLINA

Counties Where School Enterer

Skin Testing Programs Analyzed

1966-67 School Year



TUBERCULOSIS NURSING CASELOAD EVALUATION

With the increasing demands being made on public health nurses today because of expanding programs in many health areas, it has become increasingly necessary to determine areas of greatest priority based on total community needs. This trend is likely to increase in the future. If so, how will it affect tuberculosis nursing services? How can essential nursing services be provided?

In less than a decade, many changes have taken place in the prevention, control and treatment of tuberculosis. New concepts, new and better tools are available now to help in tuberculosis nursing services; although the basic philosophy of generalized family health service in tuberculosis programs has not changed, the emphasis has. It is this change in emphasis that affects and re-directs public health nursing priorities to patients with certain tuberculosis classifications and high risk groups.

Along with these changes the need has arisen for updating knowledge and information in assessing tuberculosis nursing caseloads. Much responsibility is placed on the individual nurse in determining the most effective use of her time which is dependent, in large measure, on her records. When there is a clear understanding of diagnostic standards and classification of tuberculosis, nursing time can be conserved. After careful caseload reviews, it may be determined that the supervision of some of the cases be discontinued altogether as a responsibility of the public health nurse. On the other hand, it may be found that some cases need closer nursing supervision. Some cases may be in need of current re-evaluation by the physician or other services.

A study of community nursing services in tuberculosis control programs, initiated in January, 1966, by the Nursing Advisory Service of the National

League for Nursing and the National Tuberculosis Association, included the following in the summary taken from nursing records:

> "It is evident that public health nursing services in tuberculosis control programs have inadequate knowledge of their caseloads. Apparent also is a lack of understanding of modern tuberculosis treatment methods. Public health nursing in tuberculosis control programs is one of the oldest services available to communities. This study suggests that public health nursing services have not been keeping pace with the age-old problem of tuberculosis. They need to take a new look at it, and in light of the situation in their respective communities, provide the kind of guidance to their staff members that will ensure excellent nursing care and supervision for all patients with tuberculosis, all contacts, and all suspects."[1]

To assist public health nurses in evaluating their caseloads and planning to conserve time, more educational materials have been made available along with the change in emphasis in tuberculosis control programs. For nurses wishing to gain additional information, a list of educational materials is included at the end of this booklet.

Since tuberculosis clinics are increasing in size due to shorter hospitalization periods, it is expected that more nursing time will be needed in these clinics. Here the nurses have opportunities to talk with and learn from the attending clinicians.

It also seems appropriate to mention here the utilization of heated aerosol inhalations in obtaining sputum specimens in clinics. Many believe this method of obtaining sputum is superior to the usual method in the clinic or home and, in many cases, it could be done in the clinic if appropriate facilities are provided, saving nursing time spent in home visiting.[2]

[1] South, Jean, "Public Health Nursing Services in Tuberculosis Control Programs," Nursing Outlook, January, 1967, Vol. 15, No. 1, pps. 46-49.

[2] South, Jean, Tuberculosis Handbook for Public Health Nurses, National Tuberculosis Association, Fourth Edition, 1965, pp. 44.

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In summary, perhaps public health nurses today face a greater challenge in tuberculosis control services than ever before. They can be counted on to effectively meet these responsibilities in the future.

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TUBERCULOSIS RECORDS AND PROCEDURES

Tuberculosis control programs, to be fully effective require accurately maintained and complete record systems.

During 1965 and at the request of the North Carolina State Board of Health, a review of tuberculosis records and procedures was carried out by consultants from the Tuberculosis Program, National Communicable Disease Center. As a result of this study, the case register card and the section dealing with tuberculosis of the annual report required of county health departments were revised to provide more meaningful information for quality control programs. The improvements were designed to be of primary benefit to local programs with a view to the total problem at the local level becoming more easily comprehensible in terms of being able to see more or less at a glance the complete picture relating primarily to caseholding.

Most of the information for the section on tuberculosis for the annual report may be obtained from the Tuberculosis Case Register which contains individual case register cards completed for each case of tuberculosis residing within the health jurisdiction. The Tuberculosis Case Register is often defined as the section of the health department files for organizing and recording a current summary of pertinent medical and public health information about all of the proven and suspected tuberculosis patients and their contacts. It is an indispensable tool for caseholding, case management, evaluation of program activities and definitions of local problems. Once the register is properly set-up and maintained, it provides the cornerstone of appropriate program planning and program evaluation. It makes life much easier for all involved with the program.

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Funds become available from time to time from both State and federal sources to meet tuberculosis control needs at the local level. Such funds are intended to assist local programs intensify activity to meet certain needs which are capable of definition. In order to define problem areas, records are essential. Not the least of these are communicable disease report cards in respect of new cases of tuberculosis that come to light whether from the health department, sanatorium, general hospital, or practicing physician's office. From these reports, the Division of Epidemiology is able to compile and publish figures showing the annual incidence of tuberculosis by health jurisdiction. These figures in addition to other information secured from the county annual reports are used to form the basis for the State program of tuberculosis control. They are in turn forwarded to the United States Public Health Service and form the basis in determining their aid to states and back again to local programs.

Many states have central tuberculosis case registers. North Carolina does not. Reliance is placed upon local registers. With today's increasingly mobile population, intrastate and interstate movement of cases and suspects is increasing. Records need to be transferred and transferred within a reasonable period of time if treatment or surveillance is to be uninterrupted. Records to be transferred of those persons or patients who have moved out of State are best routed through the State Health Department. Transfer of tuberculosis records for those moving within the State are best made directly.

In order to help the receiving agency when information is transmitted it is important that sufficient data be included to enable continuity of supervision to continue at the new location.

In summary, tuberculosis control programs share the same need as other public health programs for the maintenance of good records both in defining

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In summary, tuberculosis control programs share the same need as other public health programs for the maintenance of good records both in defining

the extent of the problem and in seeing what needs to be done in order to meet program objectives. The Tuberculosis Case Register is indispensable for the purpose. When requested, consultation from this department is available for reviewing, updating or setting up Tuberculosis Case Registers.

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RADIOGRAPHY IN TUBERCULOSIS CONTROL

Radiography of the chest is a quick, painless procedure. It remains an essential step in determining the presence of pulmonary tuberculosis.

The mass radiographic surveys conducted by the North Carolina State Board of Health in the past literally brought tuberculosis control to the doorstep of many North Carolina citizens. The mobile X-ray clinics made their entrance in the mid 1940's and took up to 300,000 X-ray pictures a year in their quest to uncover tuberculosis. The mass survey, together with the chest X-ray programs of health departments, hospitals and practicing physicians accounted for the discovery of many cases of tuberculosis and these discoveries started many patients on the road to recovery. Mass radiographic screening, coupled with the later developments of anti-tuberculous chemotherapy, coincided with a sharp decline in morbidity and probably contributed to today's decreased prevalence of tuberculous disease.

With the decline in morbidity and to some extent the increased concern regarding X-ray radiation to the general public, a re-evaluation of mass radiographic programs came about. As a result, more emphasis is being placed on tuberculin skin testing as the primary screening method followed by radiographic investigation of those found to be infected. This approach in no way detracts from the value of chest radiography as the most important step in determining the presence and extent of pulmonary involvement due to tuberculosis and in measuring response to treatment in established cases. It will no doubt remain the most important procedure for sometime to come in all of these areas including long-term follow-up of treated cases to guard against the possibility of reactivation escaping detection. In this connection, the need for good quality radiographic technique aimed at keeping the radiation

BACKGROUND IN TUBERCULOSIS CONTROL

Radiography of the chest is a quick, reliable procedure. It remains an essential step in determining the presence of pulmonary tuberculosis.

The mass radiography surveys conducted by the North Carolina State Board of Health in the past decade have greatly improved tuberculosis control in the counties of many North Carolina citizens. The mobile X-ray clinics made their entrance in the mid 1940's and took up to 100,000 X-ray pictures a year in their quest to uncover tuberculosis. The mass survey, together with the direct X-ray program of health departments, hospitals and practicing physicians accounted for the discovery of many cases of tuberculosis and made diagnostics available many patients on the road to recovery. Mass radiographic surveys, coupled with the later developments of anti-tuberculous chemotherapy, resulted with a sharp decline in morbidity and probably contributed to today's decreased prevalence of tuberculous disease.

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to the patient at a minimum is important as such patients will no doubt be subjected to repeated radiographic examinations throughout their lives.

The modern photofluorographic equipment located in some of the larger health centers and in the mobile X-ray clinic operated by the Tuberculosis Control Section, utilizing fast cameras, still has a definite place in primary screening for tuberculosis. But such programs are increasingly likely to be directed toward high risk groups, localities where the tuberculosis prevalence is high or where a recent outbreak has taken place.

Over the years great strides have been made in improving radiographic equipment to reduce the radiation to the patient and operator. Simplified controls have been developed, resulting in more positive control of the quality and quantity of the X-ray beam. This more reliable control over the time, KV, and MA reduces the unsatisfactory film rate. X-ray equipment has come a long way from the time the doctor had to expose himself and the patient to the rays of the fluoroscopic machine for an undetermined X-ray exposure to arrive at a conclusion as to the extent of pulmonary involvement that existed, if any. The modern radiographic equipment recommended for use in chest clinics should be able to utilize a technique requiring as little as 5 MAS to produce a radiograph of good diagnostic quality on 14 x 17 film and 10-15 MAS on 70 mm photofluorographic film. KV, of course, varies somewhat according to the thickness of the patient. An 8-1 ratio, 80 line grid is suggested with the 14 x 17 film when heavy patients are examined or laterals are requested, resulting in a radiograph of improved diagnostic quality. The use of the grid requires a technique of 15 MAS or approximately three times the radiation without the grid; however, a radiograph without the grid would be a waste of radiation to the patient, as an unsatisfactory film or one of poor quality too frequently may result. Everyone is aware that mechanical factors are not

the only source of unsatisfactory films; however, we cannot very well critize the technician until he or she has been provided with the proper modern equipment in good repair. It has long been recognized that the unsatisfactory pictures are a great waste of time, money, and unnecessary X-ray exposure to the patient and every effort should be made to avoid this problem. The answer is not multiple exposures to the patients during their visits to the clinic to assure one picture of acceptable quality.

To aid in solving this problem the Tuberculosis Control Section, North Carolina State Board of Health, now offers a consulting service which is available to all health departments in the interest of better quality radiographs and reduced radiation to the patient and operator, which incidently run hand in hand. The findings in the past have demonstrated that in many cases, by technique changes alone, the radiation to the patient can be reduced 50 percent with surprisingly better radiographic quality as an added benefit.

In summary, it is believed the chest radiograph will continue to be indispensable in diagnosis and long-term management of pulmonary tuberculosis. Today, in the light of existing relatively low prevalence in most areas, selective chest radiography as opposed to mass chest X-ray surveys of the population at large, directed towards those at high risk of developing disease as identified by tuberculin skin testing, represents a more realistic approach towards further improvement of tuberculosis control. In remaining areas of high prevalence, limited mass radiographic screening remains an important part of overall tuberculosis control activity. Modern equipment and improved technique is a must in all of this activity.

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AN ASSESSMENT OF THE TUBERCULIN SKIN TEST IN RELATION TO TUBERCULOSIS CASEFINDING ACTIVITIES IN N. C. WITH PARTICULAR REFERENCE TO CHILDREN

For many years, it has been considered that a reaction of 5 mm or more induration in response to the intradermal injection of 0.1 cc of Old Tuberculin 1:2,000 or more recently intermediate strength PPD-S (Standard Mantoux Test) indicated such individual was infected with M. tuberculosis organisms.

There are a number of factors which may affect the hypersensitivity reaction. Host factors include advancing age beyond childhood, the condition of the skin, and failure to produce hypersensitivity or suppression or depression of it due to malnutrition, overwhelming infection or the presence of other diseases. Other factors include therapy with corticosteroids, administration of viral-vaccines, optimum potency of the particular batch of antigen being used, improper technique in giving or interpreting the test and the testing method employed.

Assuming none of these factors are operating in such a way as to negate the formation and/or detection of hypersensitivity and considering only children who have grown up in the southeast United States, recent studies indicate that for such children the majority of reactions less than 10 to 15 mm are probably cross reactions due to infection with one or other of the atypical mycobacteria. This also probably applies with adults though it is here necessary to remember that with advancing age, the level of hypersensitivity is more likely to vary, probably downwards, unless infection was recent and even then it may not be so pronounced. It is also necessary to realize that the level of hypersensitivity may be low at the time of testing but may be on the way up if infection occurred recently. Also the

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There are a number of factors which may affect the hypersensitivity reaction. Most factors include advancing age, beyond childhood, the condition of the skin, and failure to produce hypersensitivity or suppression or depression of it due to malnutrition, overwhelming infection or the presence of other diseases. Other factors include therapy with corticosteroids, administration of cytotoxic drugs, optimum potency of the particular batch of antigen being used, improper technique in giving or interpreting the test and the testing method employed.

Assuming none of these factors are operating in such a way as to negate the formation and/or detection of hypersensitivity and considering only children who have grown up in the southeast United States, recent studies indicate that for such children the majority of reactions less than 10 mm are probably cross reactions due to infection with one or other of the atypical mycobacteria. This also probably applies with adults though it is more necessary to consider also with advancing age, the level of hypersensitivity is more likely to vary, probably downwards, unless infection was recent and even then it may not be so pronounced. It is also necessary to realize that the level of hypersensitivity may be low at the time of testing but may go on, the way go if infection occurred recently. Also the

"dose" of infecting organisms and the frequency of "doses" may have some bearing upon the rate at which hypersensitivity develops. In any given situation, a combination of factors may be operating to affect hypersensitivity in an individual.

In the differential diagnosis, by means of the tuberculin skin test, between infection due to M. tuberculosis and atypical mycobacteria, particularly Group III Battey organisms, a tuberculin test of a quantitative type is highly desirable if a reasonably accurate diagnosis is to be attempted. A test such as the Mantoux fulfills this requirement, if properly administered and interpreted, since a known amount of antigen is employed. This however is not the case with the various multiple puncture tests currently available--Tine, Heaf, Mono-Vac. If the multiple puncture test is strongly positive, it may be safe to assume it is equivalent to at least 10 to 15 mm induration by standard Mantoux test and may thus be indicative of infection with M. tuberculosis organisms. If however it is rather less strongly positive, it becomes indefinite in differential diagnosis unless it is confirmed by Mantoux test and the result of the latter taken as the indication of the level of hypersensitivity. It does not at present seem possible with the multiple puncture tests, since they are qualitative and not quantitative, to relate the same significance, as can be done with the Mantoux test, to various points on their scales of positivity unless they are strongly positive. Whether this argument would apply with the Jet Injector Gun is uncertain at present; but if the gun is consistently accurate in delivering a known amount of antigen (PPD-S) intradermally, the technique can be said to be a quantitative one.

Reverting to the standard Mantoux test using PPD-S, if the reaction is less than 10 to 15 mm induration read 48 to 96 hours after the test is

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Reverting to the standard Mantoux test using PPD-S, if the reaction is less than 10 to 15 mm indurations read 48 to 72 hours after the test is

given, then this probably indicates, in children with a fairly high degree of probability, that any infection is due to one or other of the atypical organisms. A "mixed" infection is not beyond the bounds of possibility but with the problem of cross reactions that occur amongst the various PPD's prepared against different varieties of mycobacteria, it would seem at present impossible to detect mixed infections by differential skin testing. The most that could be said, even with differential skin testing using several different types of antigens, is that one type perhaps predominated.

Among the characteristics of atypical mycobacteria, they do not appear to possess the same pathogenicity for man as do M. tuberculosis organisms or to be transmissible from person to person. The abundant presence in nature of these organisms particularly in the southeast United States appears to be a much less formidable proposition from the point of view of communicability and morbidity although they are capable of causing severe disease on occasion. Another characteristic of atypical mycobacteria is their much lessened susceptibility (if any) to the bacterio-static action of isoniazid, and isoniazid is not indicated in preventive treatment for infection due to atypical mycobacteria whereas it is indicated in preventive treatment in children infected with M. tuberculosis organisms. Combined drug therapy, preferably in hospital, is of course necessary for those found to have evidence of disease; but it becomes of considerable importance if the preventive use of isoniazid is being considered for those infected without evidence of disease to be as sure as possible that it will be given to children who are truly infected with M. tuberculosis organisms, or at least with this type of infection present.

It could not be considered good medical practice to be giving isoniazid to a child for his "tuberculous" infection if in fact his infection was due to mycobacteria other than M. tuberculosis. In rather the same way, it hardly

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It would not be considered good medical practice to be giving isoniazid to a child for the "conscience" situation if in fact the infection was due to mycobacteria other than M. tuberculosis. In rather the same way, it hardly

seems justifiable to be giving isoniazid to an adult suspected of being infected with M. tuberculosis organisms (no evidence of clinically active disease) if it is known or if the probability is strong that he was infected many years previously. In both cases, to place any reliance on isoniazid materially protecting such individuals runs contrary to what is presently known about the mode of action of isoniazid.

Possibly within the next year or two PPD-B may be generally available for use in assisting in differentiating between infection due to M. tuberculosis organisms and Group III Battey organisms by means of skin testing, that is perhaps where the reaction to PPD-S by standard Mantoux test is somewhere between 10 and 15 or 18 mm induration. A decision as to the causative organism could then be based on the relative size of reaction to both PPD-S and PPD-B. If the former were larger, this would indicate infection with M. tuberculosis organisms. If the latter were larger, then this would indicate infection with atypical Battey organisms.

Occasionally infection with M. tuberculosis organisms in children may not produce a very high level of hypersensitivity, particularly if the infection is recent and hypersensitivity is in the process of being elaborated, if the child has an overwhelming infection or if the hypersensitivity reaction is depressed from some other cause. For this reason and in an effort to try not to miss any cases where there may be clinical evidence of disease such as primary complex or progressive primary or miliary disease, clinical, radiological and/or bacteriological investigation and epidemiological follow-up should be carried out where the hypersensitivity is 5 mm or greater by standard Mantoux test. However, in tuberculosis control programs, priority should be given in those cases where the hypersensitivity is 10 mm or greater and such children should be considered for isoniazid treatment. Ideally, those with

seems justifiable to be giving isoniazid to an adult suspected of being infected with M. tuberculosis organisms (on evidence of clinically active disease if it is known or if the probability is strong that he was infected many years previously). In both cases, to place any reliance on isoniazid materially protecting such individuals runs contrary to what is presently known about the mode of action of isoniazid.

Possibly within the next year or two PPD-S may be generally available for use in assisting in differentiating between infection due to M. tuberculosis organisms and those of atypical acid-fast organisms by means of skin testing. That is perhaps where the reaction to PPD-S by standard Mantoux test is somewhere between 10 and 15 or 16 mm diameter. A decision as to the causative organism could then be based on the relative size of reaction to both PPD-S and PPD-B. If the former were larger, this would indicate infection with M. tuberculosis organisms. If the latter were larger, then this would indicate infection with atypical acid-fast organisms.

Occasionally infection with M. tuberculosis organisms in children may not produce a very high level of hypersensitivity, particularly if the infection is recent and hypersensitivity is in the process of being elaborated. If the child has an overwhelming infection or if the hypersensitivity reaction is depressed from some other causes. For this reason and in an effort to try not to miss any cases where there may be clinical evidence of disease such as primary complex or progressive primary or miliary disease, clinical, radiological and/or bacteriological investigation and epidemiological follow-up should be carried out where the hypersensitivity is 5 mm or greater by standard Mantoux test. However, in tuberculosis control programs, priority should be given in those cases where the hypersensitivity is 10 mm or greater and such children should be considered for isoniazid treatment. Ideally, those with

reactions less than 10 mm should be retested in six to eight weeks. A history of recent close contact with an infectious case of tuberculosis or a strong family history of tuberculosis in those children where the reaction to standard Mantoux test is less than 10 mm should exert an alerting influence on the need for close follow-up and for the possible use of isoniazid in these situations. Young children and infants who are contacts of an infectious pulmonary case ought to receive isoniazid regardless of whether they exhibit hypersensitivity or not due to the increased likelihood of serious short term complications developing in untreated infections in this age group.

There is a much stronger argument for epidemiological investigation of household associates of children with the larger size reactions compared to those with smaller reactions which, in the main, result from infection by relatively non-pathogenic and non-communicable atypical mycobacteria. The former should receive priority in receiving epidemiological investigation.

In summary, it seems reasonable that presently available multiple puncture tuberculin skin test procedures--Tine, Heaf and Mono-Vac, are satisfactory for screening. However if the objective of tuberculin skin testing school enterers is to offer isoniazid to those infected with M. tuberculosis organisms, it becomes necessary in accurately identifying those infected that they should exhibit a level of hypersensitivity to intermediate strength PPD-S 0.1 cc intradermally of not less than 10 to 15 mm induration. Any level of hypersensitivity less than this in response to 0.1 cc of intermediate strength PPD-S intradermally, in most cases, would be indicative of infection due to atypical mycobacteria and isoniazid treatment would not be indicated. Reactions larger than 15 mm induration in response to 0.1 cc of intermediate strength PPD-S intradermally would become more pathognomonic of infection with M. tuberculosis organisms the larger the reaction size gets. It is probably wise

reactions less than 10 mm should be retested in six to eight weeks. A history of recent close contact with an infectious case of tuberculosis or a strong family history of tuberculosis in those children where the reaction to standard Mantoux test is less than 10 mm should alert us to activity. Attention on the need for close follow-up and for the possible use of isoniazid in these situations. Young children and infants who are exposed to an infectious pulmonary case ought to receive isoniazid regardless of whether they exhibit hypersensitivity or not due to the increased likelihood of serious short term complications developing in untreated infections in this age group.

There is a much stronger argument for epidemiological investigation of mycobacterial manifestations of children with the larger size reactions compared to those with smaller reactions which, in the main, result from infection by relatively non-pathogenic and non-transmissible atypical mycobacteria. The issue should receive priority in planning epidemiological investigation.

In summary, it seems reasonable that presently available multiple puncture tuberculin skin tests procedures--Tine, Heat and Mono-Vac, are satisfactory for screening. However if the objective of tuberculin skin testing school children is to offer isoniazid to those infected with M. tuberculosis organisms, it cannot be necessary to correctly identify those infected that they should exhibit a level of hypersensitivity to intermediate strength PPD-S 0.1 or intermediately or not less than 10 mm induration. Any level of hypersensitivity, less than this in response to 0.1 ml of intermediate strength PPD-S intradermally, in most cases, would be indicative of infection due to atypical mycobacteria and isoniazid treatment would not be indicated. Reaction larger than 10 mm induration in response to 0.1 ml of intermediate strength PPD-S intradermally would become more predominant of infection with M. tuberculosis organisms the larger the reaction size gets. It is probably also

to continue appropriate investigation of all children who exhibit at least 5 mm induration by standard Mantoux test but with priority to those with 10 mm induration or greater.

Roy V. Berry, M. D.
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FILMS

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(Above can be loaned to health departments from North Carolina State Board of Health Film Library.)

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